Customer perspectives on polarimetry for aerosol and cloud applications, and what we can do to improve usage

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Space-based polarimeters to study the aerosol and cloud environment have been collecting data intermittently for over 20 years, starting with POLarization and Directionality of the Earth's Reflectances (POLDER) instrument on the ADvanced Earth Observing Satellite (ADEOS). At the same time the addition of ground based sun-sky photometers such as the Cimel instrument, commonly used in the Aerosol Robotic Network (AERONET) and the large collection of airborne Research Scanning Polarimeter (RSP) and Airborne Multiangle SpectroPolarimetric Imager(AirMSPI) datasets has resulted in a large but diverse dataset for the community. Many new instruments are under construction or in planning. Interest in multi-angle polarization based measurements is well founded, in theory adding much needed observing degrees of freedom to aid in constraining column aerosol size, shape, and optical properties, as well as cloud particle size distribution and scattering properties; all of which are needed to address key climate and operational aerosol and cloud model needs. Yet, despite the theoretical advantages multi-angle polarization brings, science and operational customers regularly turn to non-polarization data sources. Part of this can be attributed to limited availability due to simple bad luck (e.g., solar panel malfunctions on both ADEOS satellites and the Taurus failure for Glory). Yet other factors such as coverage, product complexity, error propagation also hinder its demand. Similarly, care must be taken to ensure the right tools are available to the user community (e.g., extraction, processing, colocation, vector codes, etc.), and the potential availability of supporting sensors is fully exploited. Processing transparency and easy product availability/accessibility are of the upmost importance. In this talk, several data "customer" perspectives are given regarding the need and use of multi-spectral polarimetry for aerosol and cloud applications, including process investigation, data assimilation, and climate data record generation. Lessons learned from past efforts including airborne missions will be outlined, and suggested best practices for future missions, data centers, and data products will be provided.

Mode of presentation: Invited